SUMMER

Meteorology—Sea-side

WITH

DIAGRAMS.

BY

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On 'Meteorology at the Seaside,' by Surgeon Major W. G. BLACK, F.R.M.S., F.R.C.S.E. *Read at the Congress of the Institute held at* WORCESTER, *and illustrated by Diagrams. September* 27, 1889.

THIS communication consisted of a sketch of the conditions of the *weather* which prevailed during the summer month of August, and autumn ones of September and October at places of *resort* on the English Channel.

The remarks are founded on a series of observations by portable *meteorological instruments* carried in a hand bag, which were set up and used where practicable at the time and place at the coast. They showed how easy such opportunities could be utilised at any place the *tourist* went to stay at. The best kind of weather for the visitor was of the *continental type*, or anti-cyclonic, with bright skies and sunny days, and when the air and sea kept up their temperature, and ozone was abundant and southerly breezes prevailed, and the seas were calm and brilliant. The *sea-bather* then indulged himself with water over 60° of temperature, and the air felt warm and dry afterwards to dress by; and the multitudes on the beaches enjoyed it. Towards the *end of the season* the weather becomes broken into by irritating cyclonettes creeping up, or cyclones dashing through the channel, which create an uncomfortable surf, and cause a rough wind to swirl on the beaches and promenades.

These irruptions brought on *gales* with showery weather and cold *winds*, which cooled the air and afterwards the sea, and which was also made uncomfortable by waves or surf on the beaches.

Besides, bathing in the sea now became *dangerous*, in consequence of the development of the backwash of the surf creating an undercurrent below sea level on the beach, which causes numerous deaths by drowning every year to inexperienced sea bathers.

The *promenades* and *piers* now get swept by disagreeable, damp winds, and by spray from the surf, and are soon abandoned on or about the *equinoctial period* of September 26th, when the bathing closes on both coasts, the cars and stages are withdrawn, and the beaches look deserted by their visitors. The *inducements* of climate that take people from grimy cities to the coast resorts, are illustrated by these instrumental observations, as consisting in more *ozone*, more breezes, more showers, more sun and air, and *less heat*, less calms, less smoke, less miasmata.

The prevalent *exodus* seems fully justified by observation of all considerations, and the *English coasts* of the British channel seem well adapted for health resorts for the citizen; and it will be to the interest of the town dweller that they should be *improved*, and extended in appliances and in accommodation for these great migrations.

Meteorology at the seaside. English Channel,

1. *Summer Observations.*

Having visited a few places on the coasts of the *Channel* during some autumns past, and observed the weather phenomena by ordinary instruments adapted for the traveller's use, the observations of three months are here summarised in the accompanying tables and curves.

Of the months, *August*, 1886, was spent at *Brighton*; *September* 1885 at *Hastings;* and *October* 1887 at Havre and Boulogne, so that a fair idea was got of *channel weather* during the seasons frequented by tourists.

All the observations have been collected together, and the numerical results put down and *summarised*, and averaged for eighty-five days or twelve weeks in the appended tables. During that time there were forty-nine forenoon tides, and thirty-six afternoon tides, and they were noted because they influence the state of both wind and sea.

1. *Ozone* was more prevalent in the *morning* observations than in the afternoon by 2·4 to 1·9, and this was probably due to the *South Westerly gales* in the Channel being most prevalent then, and so more wind blew over the papers.

In ordinary settled weather there is generally *more ozone* in the afternoons, as the ordinary *seabreezes* or winds then get up after mild mornings, and the coasts get warmed by the sun.

2. *Evaporation* was found much more than is seen in towns inland, and averaged ·12 inches per diem, and amounted to a total of 9·98 inches for three months. This seems due to more wind and sun on the coast, and freer air than in inland towns, and was highest at Brighton in August ·20 inch, and lowest at Folkestone in October ·06 inch.

3. There was a total of twenty-seven *rainy* forenoons, and twenty-five rainy afternoons, the former being due to the existence of drizzly mists, which go off further on as the day progresses.

4. The *winds* blew at a very steady rate generally, and were more in force in the morning than in the evening by 2·67 or 1·36 lbs to 2·52 or 1·20 lbs, owing to gales dying off in the afternoons, leaving calms at sunset, and fine evenings.

5. *Cloudy* weather, for like reasons, was found more prevalent in the forenoons by 6·36 to 5·74 in the evenings, also due to the occurrence of the morning's mist and drizzle.

6. The *Temperature* of the air in the rooms *inside* averaged 60°·6 in the morning, and 63°·3 in the evenings, as might be conjectured readily by advance of the day's warmth. The same may be said of the temperatures *outside* the house which were respectively 54°·5 for a.m. and 55°·9 for p.m., all generally low rates for summer and autumn seasons.

7. The *wave* amounts of the sea averaged 2·4 in the mornings, and only 1·8 in the evenings, owing to the greater strength, as shown, of the winds in the mornings, and the greater number of tides then, with high water up the beaches.

8. The general *Temperature* of *the sea* amounted to 57·1 F., as taken only in the mornings, and before it had got heated by the sun of the day, but it shows the *great heat* it holds always, even independent of the sun, as would appear, as the temperature of the air at the time on the shore only came up to 54° for daily average.

9. The *specific gravity* of the sea water averaged what might have been expected, 1025 in the Channel, where fresh rivers enter it, but it *rose* above this directly ocean seas got in, during storms blowing up it from the S.W. which stirred up the heavier layers from below the surfaces

2. *Summary of Winds.*

The numbers of times of the *winds* prevailing have been collected and added up, and there were 77 mornings in which there was some wind and 78 evenings, leaving 8 *calm* mornings and 7 *calm* evenings, which mostly occurred during the fine summer weather in August at Brighton.

The most *prevalent* winds in the mornings were S.W., occurring during the stormy weather of September and October on 26 days, and those in the afternoons were also S.W., blowing on the same occasions 24 days.

The *next* in frequency to the morning and evening were N. winds, 12 each due to *anticylonic* winds prevailing in August at Brighton, and in October at Boulogne, and the next were *westerly winds* following the subsidence of the gales in September and October, 7 days a.m. and 12 days p.m.

Gales were noted every month of more or less gravity. *August* had 2 days *stormy* weather from the S.W., occurring at the time of the new moon on the 16th at Brighton. *September* had 7 stormy days from the S.W. included in 5

storms, 1 of which occurred about the new moon, September 29th and 30th.

October had 6 stormy days, included in 3 gales, one of which was from the N. *anticyclonic* at Boulogne on October 24-25th, and the other from the S.W. at Folkestone, October 28-29th, *cyclonic* at the time of full moon on the 31st.

There was also a 3 *day's storm* from the S.W. on *November* 1-2-3rd at Folkestone, with rain and heavy seas. Altogether there were 12 *storms*, taking up 18 days, and 4 of these happened about the new and full moon, and 6 at about the quarter phases.

The *most storms* in number 3, and days 6, occurred with *tides up* about noon and midnight, when the seas were more conspicuous on the beaches at high water.

The *most winds* also occurred with forenoon tides 6, and days 9, and the least with afternoon tides 3 for 4 days when the surf is least, also, in manifestation on the low sloping shores.

3. *Summary of Storms*

The occurrence of *storms* about the change of the *moon* is a popular belief, and there appears to be certainly sufficient coincidence to warrant it, but that the moon itself is the cause may not yet be alleged.

The *storms* happening about the *major changes* appear more conspicuous on the coasts, as then the *tides* are higher, and the tidal currents stronger, and the waves larger than if the storm occurred at the neap tides, or at the *quarter moons*, when the water level is low on the beaches.

The *gales* of September 5th, 4-5 p.m., 19th, 7 a.m., 27th, 6 a.m., 28th, 7 a.m., at these half periods only lasted *one day*, and were milder in their effects on the sea, because the latter was lower on the beaches and at the piers, and the *tides* were only at their height about 4-5 o'clock in the mornings and evenings.

The *systems* to which these various *storms* belonged need

not here be entered into, as they formed part of a larger storm areas beyond the Channel, but the majority belonged to the *North Quadrants*, whether of cyclonic or anticyclonic forms.

The *Anticyclonic* one of October 24—25, 1887, at Boulogne, consisted of a sharp cold wind blowing from the N.W., N., and N.E., down the coast, with rapid clouds and open sky, and brisk waves and much beach surf, but there was little rain and no nimbus clouds, but chiefly cumulus.

The *tides* were in the morning at 4.8 a.m., and in the evening, at 4.43 p.m., and the moon three-quarters full, so that the conditions of heavy gale were not present, but the *force of the wind* got to 5—6 lbs. per square foot by anemometer, or 32—35 miles per hour, as measured.

The *Cyclonic* ones all had about the same characters, and the wind beginning S.S.W. with warm air, veered to S.W. and then W.S.W. with cooler air, and finally went to W., when they gradually died off with clear cooler weather.

They are always accompanied with heavy *rains* and low *nimbus* clouds and dark stratus, and the *waves* raised by them are large, and may be recognised often as having come from the Atlantic up the Channel.

The *Channel* seems to act the part of a *funnel* in attracting Atlantic storms to go through it; and there are along it two *dangerous gaps*, at Portland and Weymouth, and the Isle of Wight and Solent, through which the winds beat with great velocity, and raise tempestuous seas in Chessil Bay and Spithead Roads.

4. *Summary of Months*

(*a.*) The month of *August* spent at Brighton was warm and sunny, with thermometer at 63°·7 in the morning, and 67°·1 in the evening, and barometer averaging 29·96 a.m., and 29·92 p.m., and cloud quantity only made 4.5 to 5.0 at a.m. and p.m.

Ozone was well exhibited all the month, with amounts of 2.2 a.m. to 2.3 p.m., and of average quality, and it increased with S.W. winds, and decreased with N.E. winds.

Evaporation was high, or at an average of 0·20 inches per diem, shewing the air was very *dry*, though wafted from the sea itself in front; but showers, however, fell occasionally.

The *winds* were principally from the S.W. direction, though there were some from N. to N.E. to counterbalance them; but their *force* was only moderate from 2.2 a.m. to 2.0 p.m., and consequently the *wave* amounts were also small, 2.1 a.m. to 1.9 p.m., and there were 3 to 4 calm days.

The *sea* was warm, 62°·2 morning average, and so sea bathing was indulged in by crowds every day all along the beaches; its *specific gravity* was below good average (1023-6), and the air of the beach was also mild and suitable for open-air recreation, 64°·1 a.m.

(*b*). *September.*—The weather now begins to be more changeable, as it becomes now disturbed by *storms*, which leave each behind them a damper and colder atmosphere, as if there was a great *struggle* in the air to get its temperature reduced by little and little.

Notwithstanding the shorter day, the *ozone* at Hastings shews an *increase* morning and evening, owing to the increase in the S.W. or *channel winds*, from 4. a.m. to 3.8 p.m.

Evaporation at Hastings decreased by half, or to 2·31 inches or ·10 inches per diem, to ·91 inches, or 0·07 inches per diem at *Havre*, owing to increased *cloudiness*, which is now one-third more than in August, and decrease *sun power* in consequence, and bringing with it decrease of air and sea temperature by nearly 8° to 10°.

The *winds* have now increased from the S. to W. quarter, and decreased from the N., and *calms* have disappeared almost, and the winds have become stronger by 2·3 a.m. to 2·8 p.m. of degrees of Beaufort scale.

The *barometer* still continued high—up to 30·06 to 30·04—but the *air* temperature on the other hand has decreased considerably—down to 56° at 8 a.m., to 59° at 6 p.m.

The aspect of the *sea* at Hastings has become altered, as the *waves* have increased in character; their smooth serenity has now disappeared, and its *temperature* has decreased

very much—to 58° at 6 a.m., whereas the specific *gravity* has increased.

(*e.*) *October.*—The *changeable* weather has now settled down to steady work, and storms are common every week

The *ozone* shows a flickering movement, being pretty high during south-westerly weather, but relapsing after these movements are over down to from 1·2 a.m to 0·4 p.m ; and it was often *absent* at Boulogne.

Evaporation has notably decreased also with it, and only now comes to a total of 0·65 inches to 0·67 inches, or 0·06 inches per diem : due to absence of sun power and increase of *rain.*

Winds have now broken in from the N. to W. quarter as well as from the S. to W. quarter as before, and have become stronger in force, up to 4·1 a.m. and 3·2 p.m. B.S.; and *cloudiness* continues as high as in September, or 7·4 a.m. to 6·4 p.m., at Boulogne.

The *temperature* of the *air* has now come down to 10° more than last month, or to 47°·2 a.m. to 48°· p.m. ; but the *barometer* still keeps well up, or about 30·28 in. to 30·36 in. average a.m. and p.m., but soon goes down at the end.

The *sea* has increased in *wave* amount 4·2 a.m. to 2·5 p.m. with the winds, and its temperature has gone down to 51·4 Boulogne, and the *specific gravity*, 1030, has risen from the up rising of the denser water from below, and its *density* from being colder has also become greater.

5. *Description of Localities.*

(*a.*) *Brighton* seems conspicuous by the *dryness* of the air, indicated by the amount of evaporation of 0·20 inches per diem in August which is coincident with the *warmth* of the *air* at 63°·7 a.m. average in the street, and of 64·1 a.m. on the beach open to the sun.

The *temperature* of the *sea* was also notably high, 66°·2 a.m. average, but it had about the same specific gravity 1023·9 as at Hastings, and of the like quality.

The *town* looks south and lies at the bight of the Sussex bay, and hence it gets *focussed* upon it climatic and solar influences from the south, which are reflected again from its white chalky cliffs and hills, called downs.

(*b.*) *Hastings* has some characters of climate similar to Brighton, but is more sheltered from the westerly winds by Beechy Head and has abundant ozone, a moister air and cooler sea. In consequence of the under cliff site of St Leonards and Hastings it is amply sheltered from northerly winds at all times, and so is more suitable for a winter resort.

(*c.*) *Havre*, being a commercial *sea port*, suffers in its salubrity from such effects, and hence there is paucity of *ozone* 1·6 a.m. to 0·7 p.m. and a diminished evaporation 0·07 inches, and therefore increase of *dampness*, due to harbour and wet docks.

The *sea*, however, was of *first quality*, being high in temperature for September, 59°·4 and of high specific gravity 1028·2 for an estuary, and this may be due to its geographical position, being situated on a *promontory* jutting out westerly into the Channel, and hence catching the *sea currents* and breezes conspicuously from the west.

The *air* was *cooler* than at Hastings in September by 55°·7 to 56°·3 a m. and 56°·4 to 59°·4 p.m. averages in the town, and at the shore 54°·5 to 56°· a.m. also. A range of *hills* at the back of the town shelters the latter from northerly winds, otherwise it might have been as cold as Dieppe; but the *southern slopes* are covered with houses and villas, and fully exposed to the sun and air, and hence it has been made a health resort, St. Addresse.

(*d.*) *Boulogne* in respect to topographical merits has the same advantage as Havre in having a range of *heights* on the N. protecting the town below on the south from northerly winds, and so it also has been recommended as a *health resort* for shelter from winter winds. On the other side it is like Havre in showing *deficiency* of *ozone* 1.2 a.m. to 0.4 p.m., and increase of *dampness*, due to the influence of harbour and to its docks. The low *evaporation* having only been 0.06 per diem.

The *sea*, however, is as good as at Havre, being of high

temperature for the month of September 51°·4 and of high specific gravity 1028.2, and this, as before, in spite of there being a river close at hand to reduce them.

(*e.*) *Folkestone.*—The *climate* much resembles that of Boulogne, and its topography too is very similar, there is *deficiency* of ozone 2.6 a.m. to 0.4 p.m., and increase of *dampness* owing to harbour, and *evaporation* was low, having only been at 0·06 in. per diem.

The *sea*, however, was of high quality being warm 50°1 for October, and of high specific gravity 1030. The temperature of the *air* was much the same.

6. *Sea Bathing*

It will be pertinent to say something about *sea bathing* as due to the climatogical object of these remarks on the weather, and to the season of the year when this recreative pursuit is adopted. In general terms it may be stated that warmth of the *sea water above* 60° is felt to be comfortable, and below that may become disagreeable to some people, but that anything *above* 50° may be tolerated perfectly by swimmers who enjoy a cool and refreshing plunge in open water.

However it may be said that it is not the increased coldness of the water that brings the *bathing season* to an end so soon, but it is due to the more rapid increase of *coldness* and *rawness* of the *air* which our British autumns bring on.

Thus at *Brighton* in *August* we have a sea temperature of 60° and air temperature of 64° on the beach of a very comfortable character, but at *Folkestone* in *October* the sea has come down to 50°, and the air to 47° on the beach, both of which are too low to be pleasant to the ordinary bather.

Sea bathing can very well be *carried on till September 26th*, the critical date for the channel sea bathing seasons on both coasts to end.

As observed at *Havre*, on that date where the temperature of sea was up to 59°, and the sea air at 54°, but the

air was higher still at *Hastings* in the same month at 56°, though that of the sea was lower 58°.

The *temperature of the sea* seems *very stubborn* in giving way to the advent of winter, and retains its initial heat long after that of the air has descended. It is only *forced down* after prolonged bouts of Northerly (W. and E.) winds, which chill its surface and bring down cold currents from the North Sea into the English Channel. The *Channel Sea* makes fitful struggles against reduction by the occasionally shooting in of a *warm current* from the Atlantic Ocean during the prevalence of a S.W. gale, which is readily *detected* by the thermometer and by the hydrometer, indicating an increase in the temperature and specific gravity of the water.

This *increase of density* seems due to the mixture of fresh salt water from the open ocean, and not to increase of cold, as the temperatures of sea and air both rise during S. W. gales, and this occurs in spite of the *heavy rains* that burst forth then, that would lessen it by mixing it with distilled water from the clouds.

Finally, the *sea succumbs* to the protracted batteries of *arctic currents* and winds, and settles down to a *winter* hybernation of character, disagreeable alike to sailors in ships and residents of sea-side resorts.

It will be observed that the *temperature of the seas* was much *lower* at Folkestone and Boulogne further east than at Havre and Hastings further west, even allowing for *some difference* in periods of season. This would seem to have been due to the former places being situated further *east* than the latter, and so have been first reached and exposed to the *cold currents* from the North Sea coming through the straits of Dover.

The *close of the sea-bathing* season takes place about September 26th, or about the equinoctical period, when the temperature of both air and sea drops very rapidly in a few days down to the winter stages.

Proprietors of cabins or boxes and hotel keepers readily recognise the change as if by instinct and withdraw their

dressing cars, and begin the displenishing of bed rooms and saloons as the visitors insensibly diminish in numbers.

7. *Sea Waves and Beach Surf.*

Attention here may be drawn to the characteristics of the sea on the beaches at health resorts in reference to dangerous *sea-bathing.*

Enumeration has been taken of the *numbers of waves* and sea surf falling on the beaches per minute, which are found to be generally greater in height and less numerous at high water than at low water.

This seems owing to the *slope* of the beach being steeper about high water mark than at low water, when the tides recede far out to the shoaler offing, thus permitting deeper water to be maintained in shore on the flood.

These waves or *surf* have been *classed* into four sets, and designated ripple, smooth waves, crested waves, and storm surge, the first two of which are *safe to bathe* in, and the last two are dangerous even to swimmers.

The *ripple* waves number about 18 to 20 per minute, and under 1 foot in height, and the *smooth* waves 12 to 18 per minute, and are under 4 feet in height; but the *crested waves* amount to 8 to 12 per minute, and are about 4 feet to 5 feet in height; and the surge rollers come to 4 to 8 per minute, and reach about 6 to 9 feet in height on our coasts.

Another circumstance marks the limits of safe and dangerous sea bathing, and that is the length or extent of the *back water* or wash of the surge on the beach, and this is determined by, or is an expression of, the length of the wave itself outside at sea.

Everyone has experienced the discomfort and embarrasment in getting into deep swimming water by having first to *wade through* several feet of rapids and rolling stones before being able to float comfortably.

Now the wave interval of the *ripple* will be under 20 feet, so that the back-wash will probably be less than 15

feet; that of the *smooth* wave will be under 50 feet, and its baek-wash will be under 31 feet which are safe and comfortable limits for wading on the beaeh.

But, on the other hand, the *crested wave* will have a length of wave of 100 feet and a baek-wash of 75 feet or 25 yards, and the *storm surge* of 200 feet length of wave and 150 feet length of baek-wash about, or 50 yards, all of whieh are dangerous amounts. The dangerous nature of that *surf-wash* would seem to depend on the powerful rush of the sea water deseending the *slope* of the beaeh, and not eeasing then at the base of the surf, but extending far beneath it out to sea. The greater the slope of the beach the more *acceleration* will the baek-wash gain in its deseent from high water to low water, and this increased speed may thus exceed the wave speed on the surface of the water above.

Thus the *smooth* wave will have a speed of 300 to 600 feet per minute, or 3 to 6 *miles per hour*, whieh is just within the limits of swimming power; but when we come to the *crested* wave, and find its speed up to 800 feet per minute, or 9 *miles* per hour, we may readily see the futility of breasting it by human swimming eapability.

We may now then come to perceive the powerful nature of the *back wash* of the surf, that it may even on steep shores exeeed the figures given above of the wave speed, that it may amount to *much more* than six miles an hour in fair weather, or more than nine miles per hour in stormy times under water on dangerous eoasts.

In eonsequenee of this hydraulie *acceleration* the back wash will rush out to sea far beyond the tidal limits on the bottom of the shore out into deep water, and will then exhibit its powers and might by *debrading* the mud and silt, and making the sea in the offing *muddy* for a mile or two out from the shore.

This baek-wash and under or bottom eurrent on beaches will thus render *recovery of bodies* from drowning very difficult, as they will be borne away by it at the bottom of the sea to reappear somewhere else where the current has slaekened off.

In the same way the *cargoes of ships* wrecked on our stormy coasts will be drawn or sucked out of the holds by the back-wash, and *carried off* with the deep water, and there sunk if heavy, or be floated off to some more distant part if of lighter material.

In cases of *drowning* accidents the aim of the human rescuer should therefore be to get the person to be *floated* on the surface of the water, so as to get out of the under-wash, and into the *uppercurrent* that is rolling on towards the surf on the beach.

8. *Difference between City and Sea-side Climate.*

The question may now be endeavoured to be answered, what is the *instrumental difference* between the two climates that makes the citizen fly from his dwelling and office at the end of the season, and take refuge at the seaside.

Preliminarily it may be stated that the weather concerned in human climatology should only be considered as connected with a *zone of atmosphere* of some 50 to 60 feet high, or the mean height of our dwellings and hotels.

Everything of weather observation or opinion beyond and above that, may be relegated to pure or *transcendental meteorology*, which is more or entirely removed from the influence of the solid ground we live and move about on.

Previous to going to Hastings, eleven days were spent in *London in* 1885, from September 1st to 11th, when observations were taken in the town, as follows.—barometer 29·46 inches to 30·12 inches; thermometer inside 63° to 67°, outside from 50° to 64°; evaporation total 0·72 inches or about 0·06 inches per diem; rainy days seven; ozone total 2·0 or only 0·2 per diem; and winds ranged from S.W. 6 to S.E. 2 round by N. The *seaside climate*, after this at Hastings, showed four times as much ozone, twice as much evaporation, three times fewer wet days; thermometer about the same, but barometer much higher.

In comparing sets of *climatological observations* in the

Meteorological Journal for 1885, Vol. V., for Hastings and London (Old Street) for the month of *August*, it will be seen that much the same characteristics are noted. At *Hastings* the *thermometer* was higher than in London by 67°7 to 67°3, but the minimum thermometer was higher in London by 53°4 to 52·0, and the mean thermometer also was higher in London by 60°·3 to 60°·1.

The *humidity* of the air at Hastings was greater than in London by 77· to 71·, but the cloud was darker in London by 7·5 to 6·3 than at the sea side.

The number of *Rainy Days* was about the same in each, viz., 12, but there was more rain in Hastings than in London by 1·14 inches to 0·89 inches.

Again, in 1886, much the same results are to be noted in the climatological nature of the observations in Hastings and London in *August*.

The max. *Thermometer* was higher in London by 72°·2 to 62°·5 at Hastings, and the min. thermometer also by 66°·6 to 54°·7, and also the mean thermometer by 64°·4 to 62°·1.

The *humidity* of the air was greater at Hastings by 88. to 78·, but the cloudy pall was heavier in London by 9·0 to 6·8 at Hastings.

The number of *Rainy Days* was much the same in each, viz., 11 ; but the amount that fell was greater in Hastings than in London by 1·51 inches to 0·92 inches.

Those contrasted results may point to the idea that the reflected or indigenous *heat of the ground* in London may be more conducive to the suspension of the aqueous vapour in cloud than at Hastings, excluding the effect of smoke. The extra *humidity* of the air at Hastings is evidently coincident with the heavier *rainfall*, not on account of the presence of the sea itself, but rather on account of the coast being the *first land* to receive the rain-laden clouds and breezes from the S.W. and S. before they proceed inland to London. By *changing* our habitat, therefore, from London to Hastings on the coast in August, we get more *ozone* to breathe and more *breeze* to fan us; more *moisture* in the air, more *sunshine* in the sky, and more showers and a

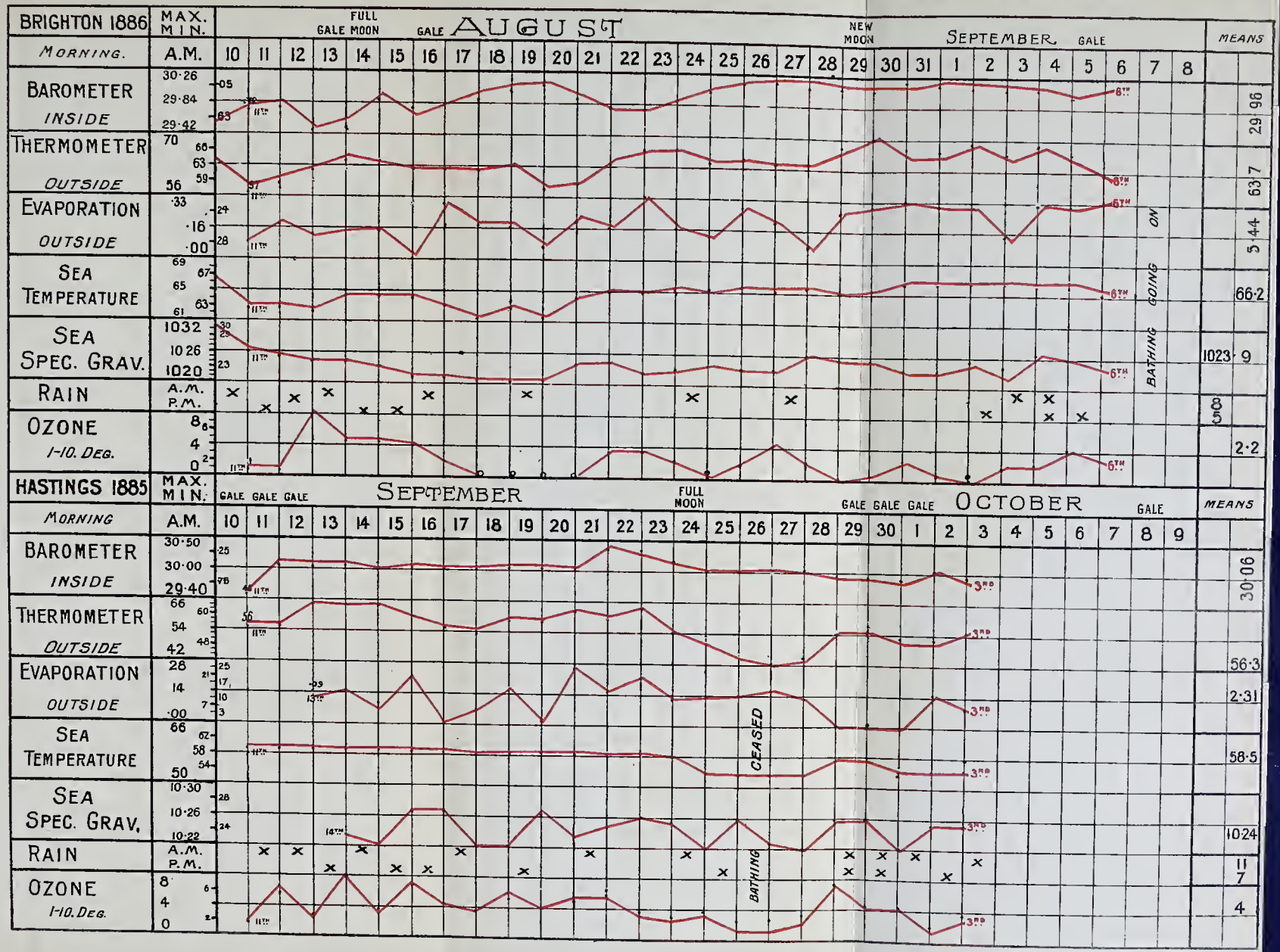
cooler and fresher air. And we fly from the stuffy *house heat*, the gloomy haze and *smoke pall*, the dry, dusty air, the *fusty calms*, the unwashed *exhalations* of the streets: all these tend to *vitiate the air* we breathe, render the blood impure, and depress and disarrange the nervous functions, both animal and mental. These statements above detailed are intended to refer solely to the instrumental observations here offered for inspection and consideration, and personally obtained by ordinary portable means.

They also only refer to such items of climate of the localities as would be of interest to the tourist and valetudinarian, but not to the requirements of the invalid or incurable, which are of a different shape and character.

DIAGRAMS.

1. Brighton, Hastings—Morning.
2. Brighton, Hastings—Evening.
3. Havre, Boulogne—Morning.
4. Havre, Boulogne—Evening.

CURVES OF METEOROLOGICAL OBSERVATIONS – SEA SIDE – SUMMER – MORNING.



W. G. BLACK, *FRMS.*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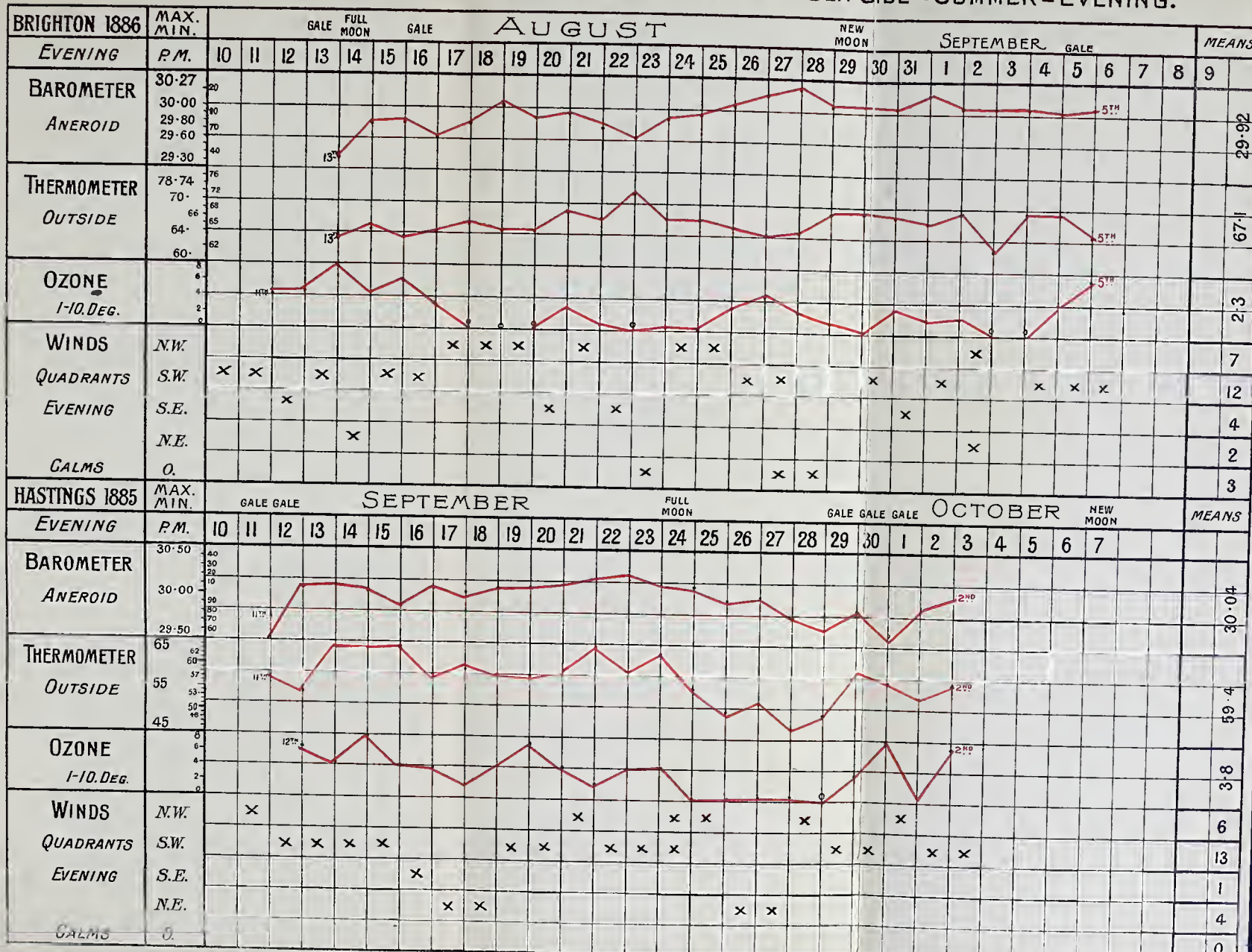
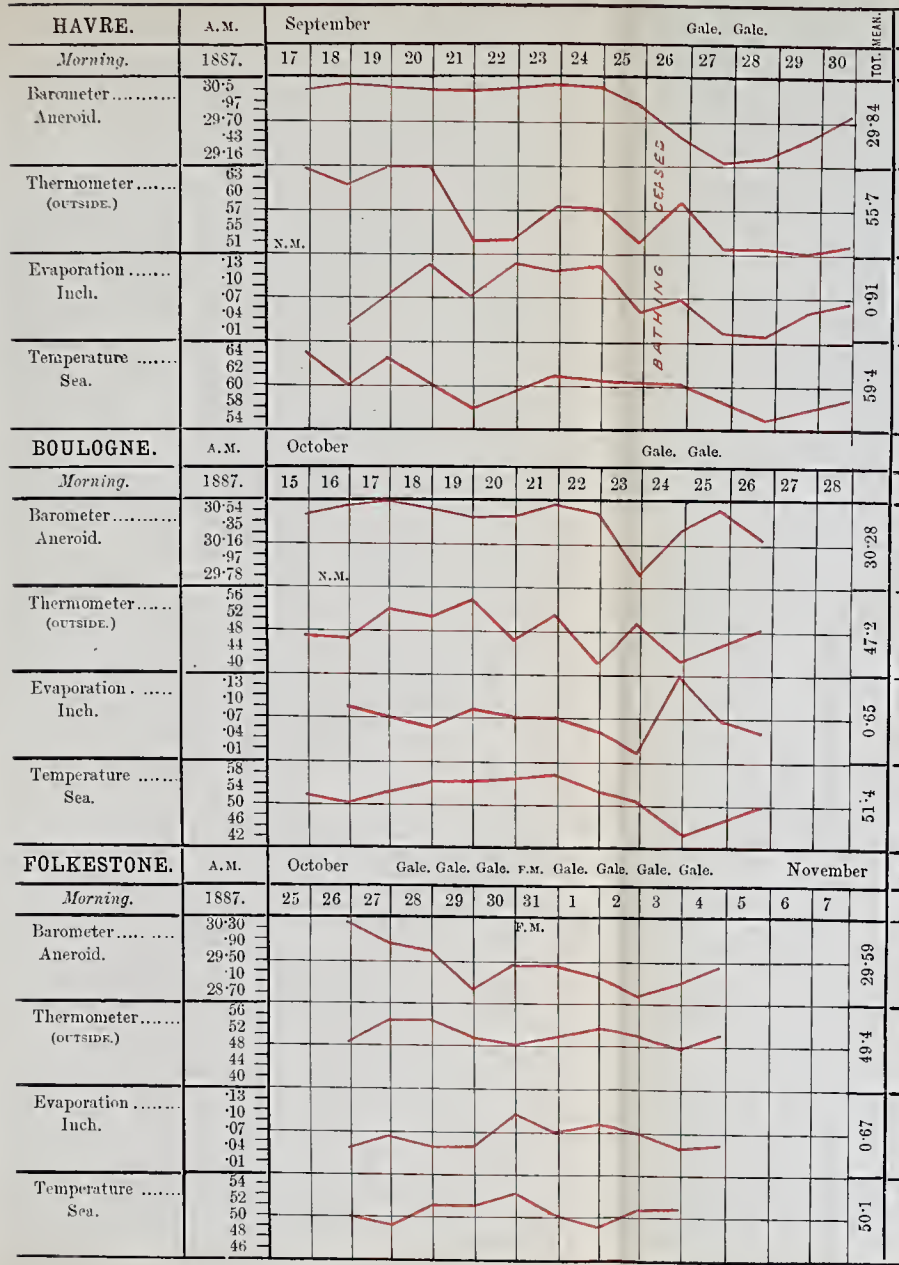
CURVES OF METEOROLOGICAL OBSERVATIONS – SEA SIDE – SUMMER – EVENING.



W. G. BLACK, F.R.M.S.

Curves of Meteorological Observations—Seaside—Autumn—Morning—1887.



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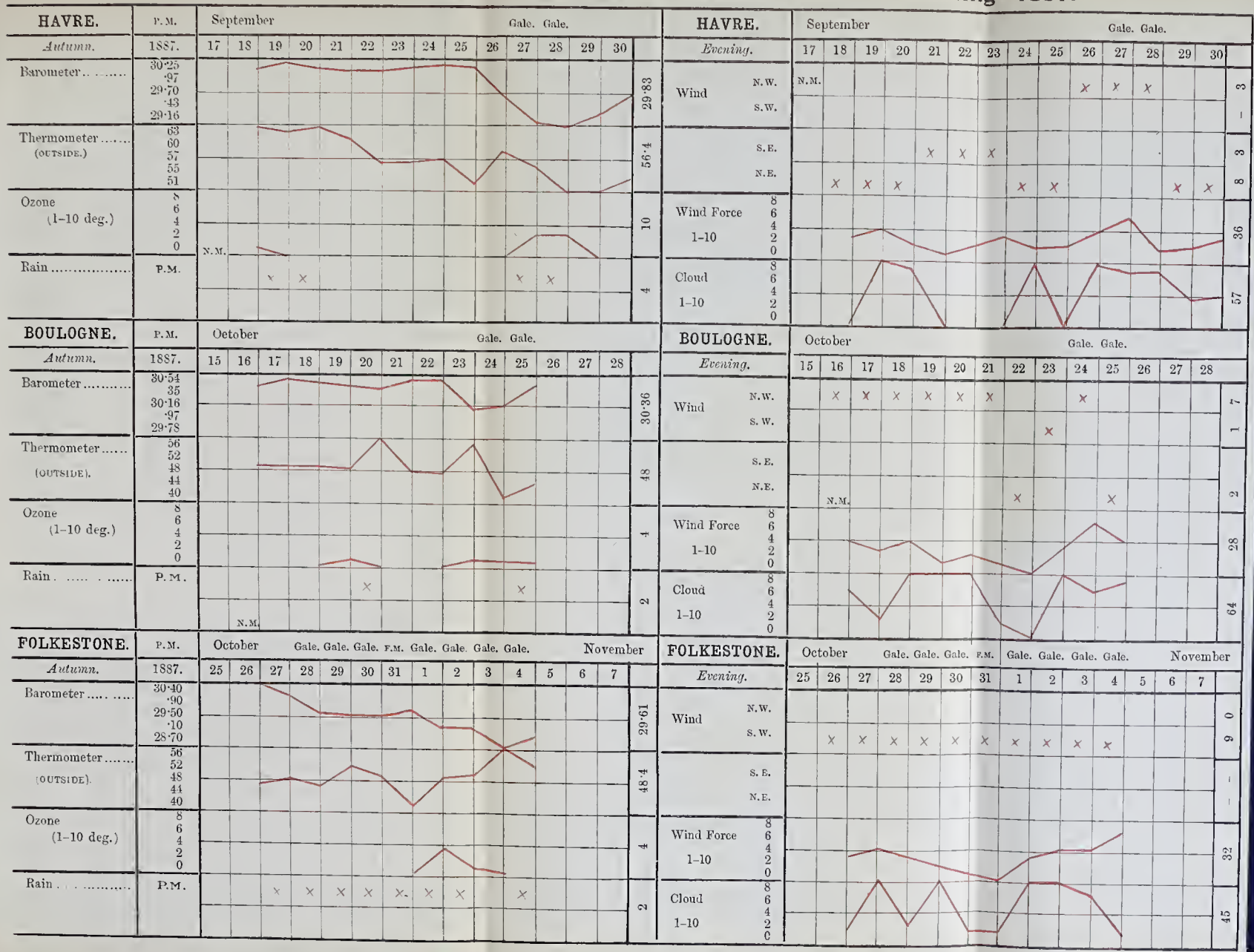
Curves of Meteorological Observations—Seaside—Autumn—Evening—1887.



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